WHAT IS CLAIMED:

1. A photomask comprising:

a semitransparent phase shifting area which has a semitransparent area and a transparent area, which are respectively transparent and semitransparent with respect to exposure light beams, and in which light beams having passed through said semitransparent area is substantially 180 degrees out of phase with respect to light beams having passed through said transparent area; and

a pattern which is formed in said photomask and in which a semitransparent phase shifting pattern and a transparent pattern are arranged in a repeated pitch equal to or smaller than the critical resolution of a projection exposure optical system.

2. A photomask according to claim 1, wherein when the repeated pitch represented by P is defined as $P = \alpha \cdot \lambda / NA$, where NA represents a numerical aperture of a projection lens, λ represents a wavelength of the exposure light beams, and $\alpha \leq 0.8$.

3. A photomask according to claim 1, wherein when a size ratio α of the size of said transparent pattern to the size of said semitransparent phase shifting pattern is defined as $\alpha = \beta \cdot \sqrt{T}$, where T represents the transmittance of the semitransparent phase shifting portion, and $0.5 \leq \beta \leq 2.0$.

4. A photomask according to claim 1, wherein when the repeated pitch P is defined as $P = \alpha \cdot \lambda / NA$, where NA represents a numerical aperture of a projection lens, λ represents a wavelength of the exposure light beams, and $\alpha \leq 0.8$, and

when a size ratio α of the size of said transparent pattern to the size of said semitransparent phase shifting pattern is defined as $\alpha = \beta \cdot \sqrt{T}$, where T represents the transmittance of the semitransparent phase shifting portion, and $0.5 \leq \beta \leq 2.0$.

5. A photomask according to claim 1, wherein an area, in which the light intensity, on a projection surface, of the light beams passed therethrough is one-half or lower than that, on the projection surface, of the light beans having passed through said semitransparent phase shifting area, includes a portion corresponding to an area which is double-exposed with a projected exposure surface thereof in the step and repeat exposure.

6. A method of forming a pattern, comprising the steps of:

forming a photoresist film on a substrate;

placing said substrate having said photoresist film on a sample stage of an aligner;

exposing a predetermined first area of said substrate by using a photomask including a semitransparent phase shifting area which has a semitransparent area and a

transparent are, which are respectively transparent and semitransparent with respect to exposure light beams, and in which light beams having passed through said semitransparent area is substantially 180 degrees out of phase with respect to light beams having passed through said transparent area, and a pattern which is formed in said photomask and in which a semitransparent phase shifting pattern and a transparent pattern are arranged in a repeated pitch equal to or smaller than the critical resolution of a projection exposure optical system;

moving horizontally said substrate; and

exposing a second area of said substrate which is adjacent to said predetermined first area by using said photomask.

7. A method according to claim 6, wherein said pattern in which said semitransparent phase shifting pattern and said transparent pattern are arranged at a repeated pitch equal to or smaller than the critical resolution of said projection exposure optical system is arranged in at least two sides which are perpendicular to each other and are located in the periphery of a pattern element area of said substrate in said photomask.

8. A method of manufacturing a semiconductor device, comprising the steps of:

forming diffusion layers in a surface of a semiconductor substrate;

forming an insulating film on said semiconductor substrate having said diffusion layers;

forming opening portions through a photoresist film on said diffusion layers by a pattern forming method, said pattern forming method including the steps of: forming said photoresist film on said insulating film; placing said substrate having said photoresist film on a sample state of an aligner; exposing a predetermined first area of said substrate by using a photomask including a semitransparent phase shifting area which has a semitransparent area and a transparent area, which are respectively transparent and semitransparent with respect to exposure light beams, and in which light beams having passed though said semitransparent area is substantially 180 degrees out of phase with light beams having passed through said transparent area, and a pattern which is formed in said photomask and in which a semitransparent phase shifting pattern and a transparent pattern are arranged in a repeated pitch equal to or smaller than the critical resolution of a projection exposure optical system; moving horizontally said substrate; and exposing a second area of said substrate which is adjacent to said predetermined first area by using said photomask;

etching selectively said insulating film with said photoresist film having said opening portions as a mask to expose said diffusion layers; and

forming a wiring layer, which is electrically connected to said diffusion layers, on said insulating film.

9. A method of manufacturing a semiconductor device, comprising the steps of:

forming a first insulating film on a substrate;

forming a first wiring layer on said first insulating layer;

forming a second insulating film on said substrate having said first wiring layer;

forming opening portions through a photoresist film on said first wiring layer by a pattern forming method, said pattern forming method including the steps of: forming said photoresist film on said second insulating film; placing said substrate having said photoresist film on a sample stage of an aligner; exposing a predetermined first area of said substrate by using a photomask including a semitransparent phase shifting area which has a semitransparent area and a transparent are, which are respectively transparent and semitransparent with respect to exposure light beams, and in which light beams having passed through said semitransparent area is substantially 180 degrees out of phase with respect to light beams having passed through said transparent area, and a

pattern which is formed in said photomask and in which a semitransparent phase shifting pattern and a transparent pattern are arranged in a repeated pitch equal to or smaller than the critical resolution of a projection exposure optical system; moving horizontally said substrate; and exposing a second area of said substrate which is adjacent to said predetermined first area by using said photomask;

etching selectively said second insulating film with said photoresist film having said opening portions as a mask to expose said first wiring layer; and

forming a second wiring layer, which is electrically connected to said first wiring layer, on said second insulating film.

10. A method of manufacturing a semiconductor device, comprising the steps of:

preparing a phase shifting mask including (a) a semitransparent phase shifting film provided at an element forming area on a photomask substrate, and (b) a light shielding area provided at a peripheral edge of said element forming area and serving to make an intensity of light having passed through said light shielding area smaller than an intensity of light having passed through said semitransparent phase shifting film, as measured on a to-be-exposed photoresist film, and said light shielding area further including a target pattern for mask aligning; and

transmitting, with a projection exposure optical system, a pattern formed element forming area of said phase shifting mask onto said photoresist film.

11. A method of manufacturing a semiconductor device according to claim 10, wherein said light shielding area includes a scribing area.

12. A method of manufacturing a semiconductor device according to claim 11, wherein said target pattern for mask aligning is disposed at said scribing area.

13. A method of manufacturing a semiconductor device according to claim 10, wherein said phase shifting mask includes a plurality of said element forming area.

14. A method of manufacturing a semiconductor device, comprising the steps of:

preparing a phase shifting mask including (a) a first semitransparent phase shifting film disposed on an element forming area and having a transmittance with respect to exposure light not higher than 25%, and (b) a light shielding area provided at a peripheral edge of said element forming area and serving to make an intensity of light having passed through said light shielding area smaller than an intensity of light having passed through said semitransparent phase shifting film, as measured on a to-be-exposed photoresist film, and said light shielding area further including a target pattern for mask aligning;

preparing a semiconductor substrate at which said photoresist film to be exposed is formed; and

transmitting, with a projection exposure optical system, a pattern formed element forming area of said phase shifting mask onto said photoresist film.

15. A method of manufacturing a semiconductor device according to claim 14, wherein said light shielding area includes a scribing area.

16. A method of manufacturing a semiconductor device according to claim 15, wherein said target pattern for mask aligning is disposed at said scribing area.

17. A method of manufacturing a semiconductor device according to claim 14, wherein said phase shifting mask includes a plurality of said element forming area.

18. A method of manufacturing a semiconductor device according to claim 14, wherein said light shielding area includes a semitransparent phase shifting pattern having a semitransparent phase shifting portion and a transparent portion.

19. A method of manufacturing a semiconductor device according to claim 18, wherein a ratio α of an area of said transparent portion to an area of said phase shifting portion is defined as $\alpha = \beta \cdot \sqrt{T}$, where T represents a transmittance of said semitransparent phase shifting portion, and β is in a range of $0.5 \leq \beta \leq 2.0$.

20. A method of manufacturing a semiconductor device, comprising the steps of:

preparing a transparent phase shifting mask including (a) a hole formation semitransparent phase shifting film formed at an element forming area on a photomask substrate, and (b) a light shielding area provided at a peripheral edge portion of said element forming area and serving to make an intensity of light having passed through said light shielding area smaller than an intensity of light having passed through said semitransparent phase shifting film, as measured on a to-be-exposed photoresist film, said light shielding area further including a target pattern for mask aligning; and

exposing, with a projection exposure optical system, a hole pattern formed on said element forming area of said phase shifting mask onto said photoresist film.

21. A method of manufacturing a semiconductor device according to claim 20, wherein said light shielding area includes a scribing area.

22. A method of manufacturing a semiconductor device according to claim 21, wherein said target pattern for mask aligning is disposed at said scribing area.

23. A method of manufacturing a semiconductor device according to claim 20, wherein said phase shifting mask includes a plurality of said element forming area.

24. A method of manufacturing a semiconductor device according to claim 20, wherein a transmittance of said semitransparent phase shifting film with respect to exposure light is not higher that 25%.